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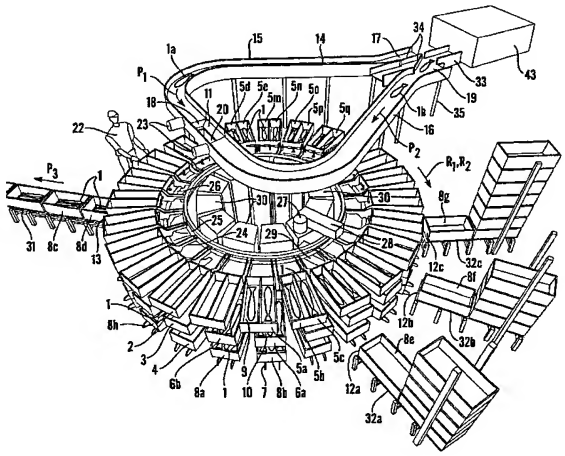
(54) Title: A METHOD AND DEVICE FOR SORTING AND PACKING OF UNSORTED OBJECTS



(57) Abstract: A device for sorting and packing of unsorted objects (1) comprises a stepwise rotatable distributing turntable (2) with distributing boxes (5), a collecting turntable (3) with collecting boxes (6), and a stepwise rotatable packing turntable (4) for packing boxes (8). The distributing turntable (2) is rotated stepwise, and objects (1) which are classified in advance are fed sequentially into the distributing boxes (5). When a distributing box (5) is located above a collecting box (6) for the relevant class of objects (1), a bottom hatch (9) in the distributing box (5) is opened, causing the object (1) to drop into the collecting box (6). The packing turntable (4) is also rotated stepwise, and when a packing box (8) for a specific class of objects (1) is located below a collecting box (6) for the same class of objects (1), bottom hatch (10) in the collecting box (6) is opened, causing the objects (1) to drop into the packing boxes (8).

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A method and device for sorting and packing of unsorted objects

The invention relates to a method for sorting and packing of unsorted objects. The invention also relates to a device for sorting and packing of unsorted objects.

Unsorted objects are found in industrial production. One example is fish, for example salmon or trout, which may come in a variety of sizes for packing or processing in a factory plant. The objects may also vary in quality, which in the case of fish may be in the form of damage to the skin or some other kind of defect in their appearance.

The objects may be sorted manually or mechanically. Before the actual sorting, each individual object has to be classified, which means that it must be assigned to a sorting class on the basis of sorting criteria. When fish are classified in a factory situation, an operator normally performs a manual quality assessment and assigns the fish to a quality class. The fish are then passed sequentially through a load cell, where each fish is assigned to a weight class. The quality class and the weight class together represent the fish's sorting class.

The fish is then sorted by being placed either manually or mechanically in a chute or channel leading to a box which is intended for the sorting class concerned. These boxes may be sales packaging, or if the fish is classified as non-marketable as a whole fish, internal recycled boxes which convey the fish to further processing, for example fillet production or cutting up into steaks.

Known plants for automatic sorting and packing of fish are space-consuming and expensive. To some extent, moreover, they are encumbered by the disadvantage that the fish become stuck or lose their position before arriving at the box. A particular problem is associated with the wish to pack the fish as tightly as possible in the boxes by having the fish lying head to tail, i.e. the fish are lying alternately in opposite directions.

The object of the invention is to provide a method and a device for sorting and packing unsorted objects, which method and device should have a high degree of automation, be rational, encumbered with few faults and require little space. A particular object is that the method and the device should be

suitable for sorting and packing of fish. In connection with packing of elongated objects, such as fish, it is intended that the objects should be able to be placed alternately in the opposite direction in the packing box.

The object is achieved according to the invention with a method and a device of the type mentioned in the introduction which are characterized by the features which are set forth in the claims.

The main components of the device for sorting and packing of unsorted objects according to the invention are composed of a distributing turntable, a collecting turntable and a packing turntable, which are arranged coaxially above one another with the distributing turntable at the top and the packing turntable at the bottom. The distributing turntable is stepwise rotatable, and along the circumference it is provided with distributing boxes with actuator-operated bottom hatches. The collecting turntable is stationary and along the circumference, under the distributing boxes, it is provided with collecting boxes with actuator-operated bottom hatches. The packing turntable is stepwise rotatable, and along the circumference, under the collecting boxes, it is provided with packing supports. The distributing turntable, the collecting turntable and the packing turntable may be designed as a total unit. The distributing turntable's and the packing turntable's stepwise rotation may be generated by step motors, step motors being understood to include any kind of stepwise movable motor, including servomotors and asynchronous motors which by means of so-called indexing transmissions can be caused to generate a rotation with the desired number of steps.

The device further comprises an object input station for sequentially feeding objects into the distributing turntable's distributing boxes. This object input station may be extremely simple, and may be composed of only one position for feeding in the objects. The objects must be classified before they arrive at the object input station. How the classification is carried out is of no significance for the invention.

The device further comprises one or more packing input stations for feeding packing boxes on to the packing turntable's packing supports, and one or more packing output stations for receipt and further transport of packing boxes from the packing turntable.

The invention further comprises a control system with a data register for recording and updating information concerning the objects, the distributing boxes, the collecting boxes and the packing boxes, and controlling the distributing turntable's and the packing turntable's stepwise rotation, the actuators for the distributing boxes' and the collecting boxes' bottom hatches, and the packing input station and the packing output station. Information concerning each individual object and where it is located is recorded in the data register and updated every time the object changes position. The same applies to the packing boxes.

By means of the invention a sorting stage and a packing stage are performed simultaneously. Both the sorting stage and the packing stage are performed as continuous cycles.

In the sorting stage a cycle is implemented where the distributing turntable with the distributing boxes are rotated one step, and the distributing boxes' positions in the distributing turntable are recorded in the data register. An object, which is classified in advance and assigned to a sorting class, is passed to the object input station, where it is fed into a distributing box which is located at the object input station. The object's sorting class, hereinafter called class, is assigned to the receiving distributing box in the data register. Subsequently, or simultaneously, by means of the data register the control system identifies which distributing boxes are located above collecting boxes for objects of the class which is located in the distributing box. The bottom hatches in these distributing boxes are opened, causing the objects to drop into the collecting boxes, and the data register is updated with information on the amount of objects in the collecting boxes. The sorting stage's cycle is thereby completed.

In the packing stage a cycle is implemented where the packing turntable with the packing boxes is rotated one step, and the data register is updated with information on the packing boxes' positions in the packing turntable. The condition of the packing boxes, i.e. whether they are filled or empty, is recorded in the data register. Filled packing boxes which are located at the packing output station(s) are removed from the packing turntable, and empty packing boxes are inserted in vacant spaces in the packing turntable at the packing input station(s). The data register is updated with information concerning the empty packing boxes' positions. The control system then

identifies by means of the data register which collecting boxes have received a predetermined amount of objects of the same class. In addition, the control system identifies which of these collecting boxes are located above empty, assigned packing boxes, i.e. packing boxes which are specified for the predetermined amount. The bottom hatches in the identified collecting boxes are opened, causing the predetermined amounts of objects to drop into and fill the packing boxes. The data register is updated with information that these collecting boxes are empty and the packing boxes filled. The packing stage's cycle is thereby completed.

The predetermined amount thus corresponds to the amount which should be in the packing boxes, and may be different for different classes, as well as for different packing boxes, since different customers may have different requirements for packing boxes and the amount in the packing boxes.

The sorting stage's cycle and the packing stage's cycle are performed simultaneously, but not necessarily at the same frequency. The sorting stage performs one cycle each time an object is fed in, while the packing stage's cycle may be performed at different frequencies. A high frequency for the packing stage's cycle will mean that many of the packing turntable's steps will not lead to filling of packing boxes or output or input of packing boxes, while too low a frequency will result in stoppage of the packing. A correct frequency for the packing stage's cycle is therefore a frequency which lies somewhere between an unnecessarily high frequency and too low a frequency. The correct frequency will depend on the number of classes, the number of distributing boxes, the number of collecting boxes, the number of different packing boxes and the extent of the predetermined amount.

In a preferred embodiment the invention comprises an object conveyor for conveying the classified objects from the classification station to the object input station, which object conveyor comprises two channels or tracks which have inlets in substantially the same direction, and outlets facing each other. An elongated object which is passed from the classification station to the object input station will thereby, depending on which channel it is passed through, receive one of two opposite orientations at the object input station. By allowing the control system to ensure that objects of the same class are each fed alternately into a channel at the classification station, the aim is achieved that objects of the same class will be fed into the distributing

turntable alternately in opposite directions. This is particularly advantageous in sorting and packing of fish.

The invention will now be explained in more detail in connection with a description of a specific embodiment, and with reference to the drawings, in which:

fig. 1 is a perspective view at an angle from above of a plant for sorting and packing of fish,

fig. 2 is a perspective view from the side of the plant in fig. 1,

fig. 3 is a perspective view at an angle from above of a detail of the plant,

fig. 4 is a view from the side of a detail of the plant, and

fig. 5 is a view from above of the detail in fig. 4.

Parts which are fundamentally identical are indicated by the same reference numerals. Letter endings are used to distinguish between identical parts when this is necessary in order to explain the invention.

Fig. 1 is a perspective view at an angle from above of a plant for sorting and packing of objects in the form of fish, or more precisely farmed salmon, for placing in a factory. The plant's main parts consist of a stepwise rotatable distributing turntable 2, a coaxial, stationary collecting turntable 3 located below the distributing turntable 2, and a coaxial, stepwise rotatable packing turntable 4 located below the distributing turntable 2 and the collecting turntable 3. Distributing boxes 5 are arranged along the distributing turntable's 2 circumference, while collecting boxes 6 are arranged along the collecting turntable's 3 circumference, under the distributing boxes 5. The packing turntable 4 is provided along the circumference with packing supports 7, for placing packaging 8 in the form of boxes, under the collecting boxes 6.

The collecting boxes 6 and the packing boxes 8 will contain several fish at one time, whereas the distributing boxes 5 will only contain one fish at a time. This is why the distributing boxes are much smaller than the collecting boxes. It can be seen that the distributing boxes, for example 5b and 5c, are combined in twos to form a double box or carriage. Depending on the size of

the plant, the number of distributing boxes in each carriage may vary from one to a greater number, for example four.

The distributing boxes 5 and the collecting boxes 6 are provided with actuator-operated bottom hatches, indicated by reference numerals 9 and 10 respectively, with the result that when the hatches are open the fish can drop out of the distributing boxes 5 into the collecting boxes 6, and from the collecting boxes 6 into the packing boxes 8.

The distributing turntable 2, the collecting turntable 3 and the packing turntable 4 are supported by central foundation pillars 30. The collecting turntable is securely connected to the foundation pillars, while the distributing turntable and the packing turntable are rotatably mounted via upper and lower supporting rings, which for the distributing turntable 2 are indicated by reference numerals 25 and 26 respectively.

A drive motor 27 generates the distributing turntable's 2 rotary motion via a transmission 28, and a non-illustrated drive motor generates the packing turntable's 4 rotary motion via a transmission 29. The rotary motions of the distributing turntable and the packing turntable are therefore independent of each other. As mentioned previously, the rotary motion of both the distributing turntable and the packing turntable is stepwise, this being achieved by the use of step motors.

The plant further comprises a schematically illustrated classification station 43 for classification of fish 1, and an object conveyor 14 for conveying the fish 1 to an object input station 11 for sequentially feeding the fish 1 into the distributing turntable's 2 distributing boxes 5. If the classification station 43 had been located directly above the distributing turntable 2, the object conveyor 14 could have been omitted, or consisted of only a single chute. The illustrated object conveyor, however, is highly advantageous, and will be discussed in more detail later.

Three packing input stations 12a-c are further illustrated for feeding packing boxes 8 on to the packing turntable's 4 packing supports 7. The packing input stations 12a-c are of a known type, where stacks of packing boxes 8e-g which are placed on conveyor belts 32a-c by means of non-illustrated pneumatic actuators can be pushed on to the packing supports 7.

A packing output station 13 is also illustrated for receipt of the packing boxes 8 after they have been filled with fish 1. The packing output station 13 is also of a known type, where non-illustrated pneumatic actuators can pull the packing boxes 8 out of the packing supports 7 in the direction P_3 and on to a conveyor belt 31 for further transport to another location in the factory.

The plant further comprises a control system for controlling the plant's various components, including the distributing turntable's 2 and the packing turntable's 4 rotation, the actuators for the distributing boxes' and the collecting boxes' bottom hatches 9, 10, and the actuators for the packing input station 12 and the packing output station 13. The control system comprises a data register for recording and updating all necessary information, including information concerning the fish 1, the distributing boxes 5, the collecting boxes 6 and the packing boxes 8. The data register will also record production orders, keep production statistics and log interruptions of operations, as well as generating related reports. The control system may comprise a computer with power supply and connections to the actuators and the motors, various sensors, lamps and manual and automatic switches. The computer may be located in a cabinet with a control panel on the front, and may be worked by an operator.

As already mentioned, the classification of the fish is performed in the classification station 43. Here a visual quality assessment is performed where each fish is classified as "superior" or "ordinary", i.e. fish which is sold whole, "production", i.e. fish which goes to further processing, for example filleting, or "reject", i.e. fish which goes to be ground up. Alternatively, the quality assessment may be performed automatically with a scanner, or possibly a combination of scanner and manual assessment. The classification further comprises a weighing process, the fish being assigned to a weight class. Both the fish's quality class, weight class and weight are recorded in the computer system.

The weight of the fish varies from under 1 kg to over 9 kg. "Superior" and "ordinary" are divided into the weight classes required by the customer. "Production" may be divided into the weight classes which suit the processing machine, while "reject" includes only one class. Each collecting box 6 is assigned to a specific class in the data register. The illustrated collecting turntable comprises 24 collecting boxes 6, and thus if necessary

the most common classes can employ two collecting boxes. The distribution of classes will be placed in relation to the weight variation of the fish which is being sorted and packed.

In the operation of the plant a sorting stage is performed simultaneously with a packing stage. Both the sorting stage and the packing stage are performed as continuous cycles.

The sorting stage is initiated by the distributing turntable 2 being rotated one step in the direction R_1, causing all the distributing boxes 5 to move one step forward. The distributing boxes' 5 new positions in the distributing turntable 2 are recorded in the data register.

A fish 1 is then conveyed from the classification station 43 via the object conveyor 14 to the object input station 11, where it is fed into the distributing box 5 which is located below the object input station 11. In the illustrated embodiment the feeding in process is implemented by the fish 1 dropping into the distributing box. The fish's class is assigned to the receiving distributing box 5 in the data register.

There will now be a fish in several of the distributing boxes, while other distributing boxes will be empty. With reference to fig. 1 it can be seen that there are fish in distributing boxes 5a, 5b, 5c, 5d, 5e, 5m, 5n, 5o, 5p and 5q (which are chosen at random), while the rest of the distributing boxes 5 are empty.

Subsequently, or simultaneously, the control system identifies the distributing boxes 5 which are located above collecting boxes 6 for fish 1 of the same class. This may be carried out by comparing each distributing box's 5 class and position in the distributing turntable 2 with each collecting box's 6 class and position in the collecting turntable 3. If both class and position coincide, the said distributing boxes 5 are identified. The bottom hatches 9 in these distributing boxes are then opened, causing the fish 1 to drop into the collecting boxes 6. The data register is updated with information concerning the amount of fish in the collecting boxes 6. The collecting boxes 6 will thereby gradually be filled with fish of the same class.

The sorting stage is thereby completed, and the distributing turntable is again moved forward one step.

The packing stage is initiated by the packing turntable 4 being rotated one step in the direction R_2, causing all the packing boxes 8 to move one step forward. The packing boxes' 8 new positions in the packing turntable 4 are recorded in the data register.

The control system ascertains whether the packing box 8 which is located at the packing output station 13 is filled with fish 1, and if so, it is transferred out of the packing turntable 4 on to the conveyor belt 31. The control system also ascertains which positions on the packing turntable 4 are vacant, and if a position at one of the packing input stations 12a-c is vacant, an empty packing box 8 is inserted in this position. The data register is updated with information on the empty packing boxes' positions.

Subsequently, or simultaneously, the control system identifies the full collecting boxes 6 which are located above empty, assigned packing boxes 8, i.e. packing boxes which are specified for the predetermined amount of fish of the class which is located in the collecting box 6. This identification may be performed by checking for each collecting box 6 by means of the data register whether the underlying packing box 8 has the same class, since the underlying packing box 8 is the packing box which has the corresponding position in the packing turntable 4 to that which the collecting box 6 has in the collecting turntable 3. In addition, a check is made as to whether the collecting box 6 contains the predetermined amount of fish, and whether the packing box 8 is empty. If all these checks are positive, the collecting box 6 with the underlying packing box 8 is identified as mentioned above. The identified collecting boxes' bottom hatches 10 are opened, causing the fish in the collecting boxes to drop into and fill the packing boxes 8. Empty collecting boxes are assigned to new classes. If collecting boxes at the packing input station 12 or packing output station 13 are identified, which the control system ascertains by a further check of the collecting boxes' 6 and the packing boxes' 8 positions, a special case arises where it is possible for the filling of fish in the packing boxes 8 to be carried out simultaneously with input or output of the packing boxes. In these special cases the control system arranges for a reduction of the speed of the different operations, thus ensuring that the operations occur sequentially. This speed reduction is of course undesirable, and the collecting boxes at the packing input station 12 or the packing output station 13 will therefore normally be used for the least common classes, so that these special cases rarely occur.

The data register is updated with information concerning the amount of fish in the collecting boxes 6 and the packing boxes 8. The predetermined amount of fish, i.e. the amount of fish which should be in the packing boxes, may either be based on the number of fish of a specific class, or it may be based on weight. In the latter case, the predetermined amount of fish is compared with the sum of the weight of the fish located in the collecting box 6. When a packing box 8 is filled this weight can be assigned to the packing box in the data register, and transferred to a sales document, or the weight may be added to the packing box 8 at the packing output station 13. After removal on the conveyor belt 31, the weight of the packing box 8 will be checked before the packing box is marked with ink jet or a label affixed thereto. If the check weight differs from the control system's recorded weight, the packing box 8 will be ejected from the conveyor belt to a non-illustrated sorting out location.

With reference to fig. 1 it can be seen that there is fish in collecting boxes 6a and 6b (which are chosen at random), while the rest of the collecting boxes 6 are empty. It can further be seen that there is fish in packing boxes 8a and 8b (which are chosen at random), while the rest of the packing boxes in the packing turntable 4 are empty. At the packing output station 13 all the packing boxes are filled with fish, illustrated by 8c, 8d.

Fig. 2 illustrates the plant in fig. 1 viewed from the side. Here it can be seen that there is fish in the collecting boxes 6c and 6d, while the rest of the collecting boxes are empty. Furthermore, packing boxes 8c, 8d, 8i and 8k are filled with fish, while the rest of the packing boxes are empty. It is understood that packing boxes which are assigned to collecting boxes, which viewed in the rotational direction R_2 are located beyond the packing output station 13, will pass the packing output station in an empty state. An operator 22, who is also illustrated in fig. 1, monitors the plant's operation.

The packing stage is hereby concluded, and the packing turntable is again moved forward one step.

In the embodiment in fig. 1 the distributing turntable and the packing turntable rotate in the same direction. This is not a condition, and the sorting plant functions equally well if the distributing turntable and the packing turntable rotate in opposite directions. The distributing turntable rotates one

step for each fish which enters the distributing turntable. A typical speed is 40 steps per minute. As mentioned in the general part of the description, the packing turntable may have several speeds, depending on the number of classes, number of distributing boxes, number of collecting boxes, number of different packing boxes and the extent of the predetermined amount.

The number of distributing boxes, collecting boxes and packing supports will vary according to the need for sorting classes. The number of distributing boxes will normally be double the number of collecting boxes and packing supports, the number of the last two normally being identical. The number of collecting boxes in the collecting turntable and the number of positions in the packing turntable will always have to be slightly greater than the number of classes. There are two main reasons for this: when a packing box 8 is removed from the packing turntable 4 at the packing output stations 13, its position in the packing turntable will remain empty until a new packing box is inserted at one of the packing input stations 12a-c. Moreover, when a collecting box is full, it will normally take some time before an empty packing box arrives at the collecting boxes' position, and when a collecting box is full, an empty collecting box is therefore assigned to the same class. Nevertheless, the utilisation of the collecting boxes and the packing boxes is extremely high, and in a plant with 24 collecting boxes, as illustrated in figs. 1 and 2, approximately 20 different classes can be employed.

As already mentioned, the object conveyor may be omitted if the classification station 43 is located immediately above the distributing turntable 2, or the object conveyor may consist of a single chute or a single conveyor belt.

The illustrated object conveyor 14, however, is highly advantageous. The object conveyor 14 comprises two channels or tracks 15, 16, which are supported by pillars 35. The channels 15, 16 could have been designed as sloping chutes, but are designed as conveyor belts with directions of travel illustrated by the arrows P_1 and P_2 respectively, since this provides a more reliable transport. The conveyor belts are each operated here by their own drive unit 23. The channels 15, 16 have inlets 17 and 19 respectively in substantially the same direction. The inlets are located downstream of a conveyor belt 33 which conveys fish from the classification station 43. By means of two actuator-controlled, rotatable guide arms 34, which are

controlled by the plant's control system, the fish 1 can be inserted either into inlet 17 or 19. Fish which are classified as rejects, or which have not been registered within the weight classes in the load cell, are not affected by the guide arms 34. These fish continue straight ahead on the conveyor belt 33 and drop into a non-illustrated collecting vessel.

The channels 15, 16 travel in opposite arcs which end in and are joined at the object input station 11, with the result that the outlets 18, 20 face each other. A fish 1 which is fed into one of the object conveyor's inlets 17, 19 thereby receives one of two opposite orientations at the object input station 11, depending on which channel 15, 16 it was passed through. It can be seen in fig. 1 that the fish 1a is passed along channel 15, and that fish 1b is passed along channel 16. The speed of the conveyor belt and the length of the channels will be known, and on this basis the control system can synchronise the classifying and feeding of fish into the distributing boxes 5. The object input station 11 consists only of an opening, where the fish drops into the distributing box which is located below the opening.

By alternately feeding fish of the same class into each of the channels, and assuming that the fish have the same orientation at the outlet of the classification station, the object is achieved that alternate fish are facing in opposite directions in the packing boxes, thus providing better utilisation of space in the packing boxes than if all the fish were facing in the same direction.

Fig. 3 is a perspective view at an angle from above of the portions of the distributing boxes which face in towards the central foundation pillars 30. Fig. 3 also illustrates the object input station 11, the upper support ring 25 and the lower support ring 26. The upper and lower support rings are securely connected to the foundation pillars 30, and are therefore stationary. It is further shown how two distributing boxes 5f, 5g are connected to form a double box or carriage, which in turn is connected to two distributing box brackets 24. The distributing boxes' bottom hatches 9 are kept closed by lock springs 21 which act on the bottom hatches via arms 36. The lock spring 21g with the arm 36g act on the bottom hatch in the distributing box 5g, the lock spring 21f with its arm (hidden in the figure) act on the bottom hatch in the distributing box 5f, and the lock spring 21h with the arm 36h act on the bottom hatch in the distributing box 5h, and so on. The lock springs 21 are

attached to the brackets 24, following the distributing turntable's 2 rotation. The lock springs may be mechanical or pneumatic, and will always attempt to keep the bottom hatches closed.

Fig. 4 is a view from the side, and fig. 5 is a view from above, of a distributing box bracket 24 with two distributing boxes 5k, 5l, the upper and lower support rings 25, 26, which are illustrated in cross section, and associated components. Two concave upper rollers 38 are rotatably secured to an upper area of the bracket 24, each abutting against a side of the upper support ring 25. Similarly, two concave lower rollers 39 are rotatably secured to a lower area of the bracket 24, each abutting against a side of the lower support ring 26. The bracket 24 and the distributing boxes 5k, 5l, which together form a carriage which forms part of the distributing turntable 2, are thereby freely movable along the upper and lower support rings 25, 26, thereby providing a free, rotatable mounting of the distributing turntable 2. The packing turntable 4 is mounted in a similar manner.

Fig. 4 further illustrates a stationary actuator 46 for opening the bottom hatches 9, with an associated actuator arm 45 and an actuator shaft 44 which extends from the actuator arm 45 to the bottom hatch 9, but without being connected thereto. The plant has one actuator 46 for each position of distributing boxes 5 in the distributing turntable 2. The actuators 46 are stationary, while the distributing boxes' bottom hatches 9 rotate together with the distributing boxes. The distributing turntable's stepwise rotation will always bring the distributing boxes 5 into the same position relative to the actuators 46, and activation of an actuator 46 will thereby open the bottom hatch 9 which is located adjacent to the actuator. The collecting boxes' bottom hatches 10 are stationary, and are opened by stationary actuators, which is not illustrated in the figures.

Figs. 4 and 5 also illustrate how the movement is transferred from the drive motor's 27 transmission 28 to the brackets 24. A toothed belt 37 encircles the entire distributing turntable, on the outside of corresponding toothed portions 40 of the brackets 24, with the result that the brackets follow the toothed belt's movement. The transmission 28 is provided with a downwardly directed, driven, toothed drive pulley 41 for the toothed belt 37, and two downwardly directed, freely running tension pulleys. The toothed belt 37 is passed round the drive pulley 41 and kept in place by the tension pulleys 42.

When the drive pulley 41 is rotated, the toothed belt 37 is pulled in the direction of rotation, with the result that the brackets 24 and thereby the entire distributing turntable 2 are rotated. The packing turntable 4 is rotated in a similar manner.

The control system keeps a check at all times on the necessary information concerning the fish, the distributing boxes, the collecting boxes and the packing boxes. In the case of normal, continuous operation of the system, therefore, there will be no need for sensors. This is a great advantage, since experience shows that sensors are often the source of operational problems. The plant will nevertheless include a few sensors for detecting faults which may arise. An example of such a sensor may be a photocell which registers whether the fish from the classification stations drops into the distributing box.

In addition to the above-mentioned functions the control system will also contain a number of other functions, particularly in connection with start-up and stop. Another example is functions associated with the use of different marked packing boxes, each of which can be fed into the packing turntable from its own packing input station 12a, 12b, 12c. This applies in the case where different customers have to receive fish of different classes, and wish different packaging. Logic functions in the control system will at all times keep a check on where the different packing boxes are located in the packing turntable, thus ensuring that they are filled with fish of the correct class. Similarly, it is also possible to employ more packing output stations 13, and discharge each of the different types of packing boxes at its own packing output station.

On account of the need to keep it within reasonable limits, a complete description cannot be provided regarding functions of this kind, which will be capable of implementation by a person skilled in the art.

PATENT CLAIMS

1. A method for sorting and packing of unsorted objects (1), characterized by simultaneous, continuous implementation of a sorting stage and a packing stage, wherein the sorting stage comprises the following cycle:

s1) a stepwise rotatable distributing turntable (2) with distributing boxes (5) arranged along the circumference is rotated one step,

s2) the distributing boxes' (5) positions in the distributing turntable (2) is recorded in a data register in a control system,

s3) an object (1) is classified in a classification station (43) and conveyed to an object input station (11),

s4) the object (1) is fed into a distributing box (5) which is located at the object input station (11), and the object's class is assigned to the receiving distributing box (5) in the data register,

s5) bottom hatches (9) are opened in distributing boxes (5) which are located above collecting boxes (6) for objects (1) of the same class, causing the objects (1) to drop down into the collecting boxes (6), the collecting boxes (6) being arranged along the circumference of a coaxial, stationary collecting turntable (3) located below the distributing turntable (2),

s6) the data register is updated with information concerning the amount of objects (1) in the collecting boxes (6),

and the packing stage comprises the following cycle:

p1) a coaxial, stepwise rotatable packing turntable (4) located below the collecting turntable (3) with packing boxes (8) placed releasably along the circumference is rotated one step,

p2) the data register is updated with information concerning the packing boxes' (8) positions in the packing turntable (4),

p3) filled packing boxes (8) are removed from the packing turntable (4) at one or more packing output stations (13), and empty packing boxes (8)

are inserted in vacant spaces in the packing turntable (4) at one or more packing input stations (12),

p4) the data register is updated with information concerning the positions of the empty packing boxes (8),

p5) bottom hatches (10) are opened in collecting boxes (6) which have received a predetermined amount of objects (1) of the same class, and which in addition are located above assigned, empty packing boxes (8), causing the predetermined amounts of objects (1) to drop down and fill the packing boxes (8),

p6) the data register is updated with information concerning the amount of objects in the collecting boxes (6) and the packing boxes (8).

2. A method according to claim 1, characterized in that stage s5) comprises the comparison of each distributing box's (5) class and position in the distributing turntable (2) with each collecting box's (6) class and position in the collecting turntable (3), and if both class and position coincide, the distributing box's bottom hatch (9) is opened, causing the object (1) to drop into the collecting box (6).

3. A method according to claim 1 or 2, characterized in that stage p5) comprises the comparison of each collecting box's (6) class and position in the collecting turntable (3) with each packing box's (8) class and position in the packing turntable (4), and if both class and position coincide, the amount in the collecting box (6) corresponds to the predetermined amount and the packing box (8) is empty, the collecting box's bottom hatch (10) is opened, causing the predetermined amount of objects (1) to drop into the packing box (8).

4. A method according to one of the preceding claims, characterized in that stage s3) comprises weighing of the object (1), assigning a weight class to the object (1), and updating the data register with information concerning both the object's (1) weight and weight class, that the predetermined amount of objects is based on weight, and that stage p5) comprises comparison of the predetermined amount with the sum of the weight of the objects (1) which are located in the collecting box (6).

5. A method according to one of the preceding claims, characterized in that stage s3) comprises weighing of the object (1), assigning a weight class to the object (1), and updating the data register with information concerning both the object's (1) weight and weight class, and that stage p6) comprises updating of the data register with information concerning the sum of the weight of the objects (1) which are located in the packing box (8).

6. A method according to one of the preceding claims, where the objects (1) are elongated, characterized in that the objects (1) are conveyed from the classification station (43) to the object input station (11) through one of two channels or tracks (15, 16) which have inlets (17, 19) substantially in the same direction and outlets (18, 20) facing each other, with the result that depending on which channel (15, 16) the objects (1) are passed through, they receive one or two opposite orientations at the object input station (11).

7. A method according to one of the preceding claims, characterized in that it is used for sorting and packing fish (1).

8. A device for sorting and packing of unsorted objects, characterized in that it comprises:

- a stepwise rotatable distributing turntable (2) with distributing boxes (5) which are arranged along the circumference and provided with actuator-operated bottom hatches (9),

- a coaxial, stationary collecting turntable (3) located below the distributing turntable (2), with collecting boxes (6) which are arranged along the circumference, below the distributing boxes (5), and which are provided with actuator-operated bottom hatches (10),

- a coaxial, stepwise rotatable packing turntable (4) located below the distributing turntable (2) and the collecting turntable (3) with packing supports (7) arranged along the circumference, below the collecting boxes (6),

- an object input station (11) for sequentially feeding classified objects (1) into the distributing turntable's (2) distributing boxes (5),

- one or more packing input stations (12) for feeding packing boxes (8) on to the packing turntable's (4) packing supports (7),

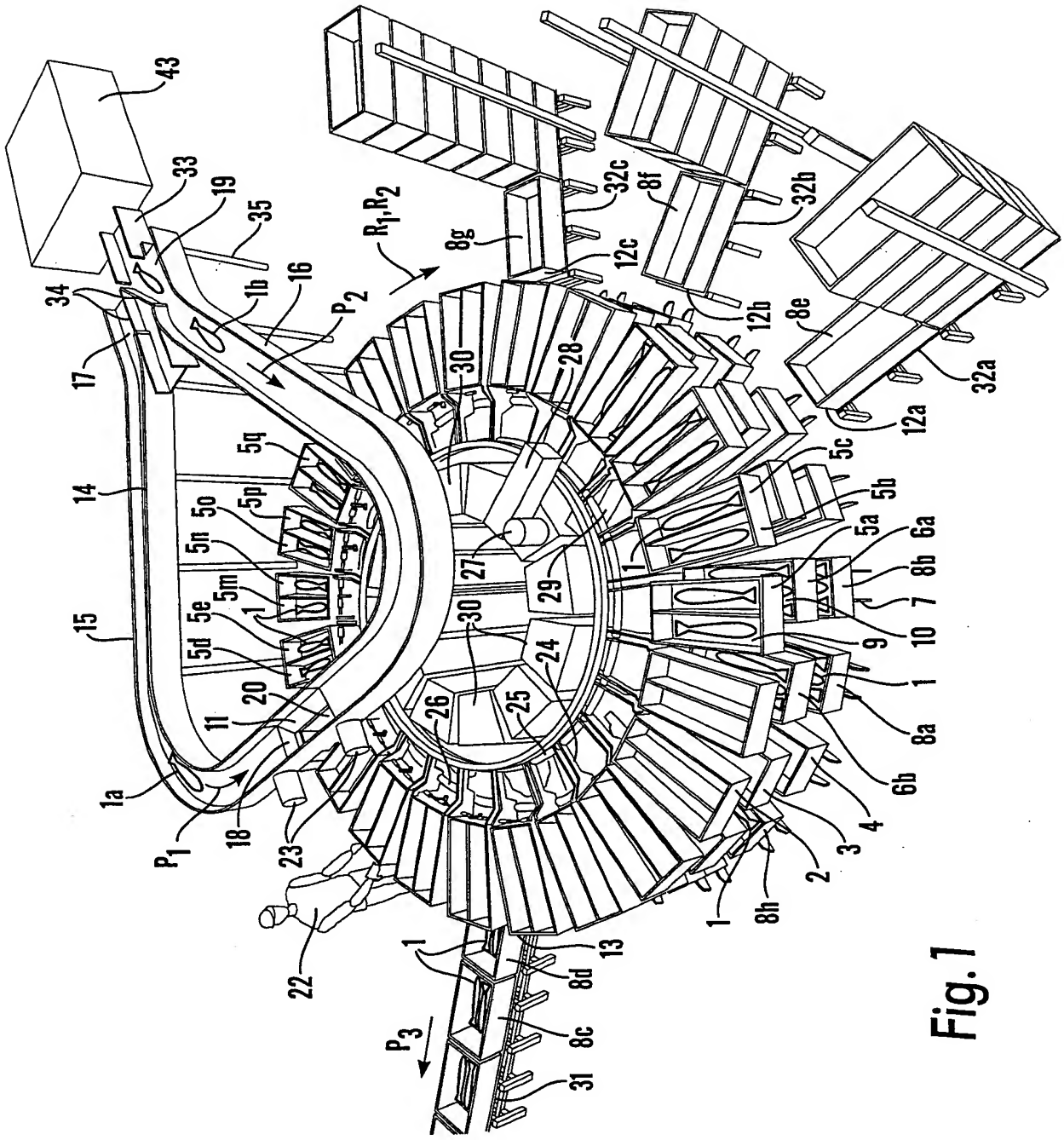
- one or more packing output stations (13) for receipt and further transport of packing boxes (8) from the packing turntable (4),

- a control system with a data register for recording and updating information concerning the objects (1), the distributing boxes (5), the collecting boxes (6) and the packing boxes (8), and controlling the distributing turntable's (2) and the packing turntable's (4) rotation, the actuators (46) for the distributing boxes' and the collecting boxes' bottom hatches (9, 10), and the packing input station (12) and the packing output station (13).

9. A device according to claim 8,
characterized in that it comprises an object conveyor (14) for transport of the classified objects (1) from the classification station (43) to the object input station (11), and that the object conveyor (14) comprises two channels or tracks (15, 16) with inlets (17, 19) in substantially the same direction and outlets (18, 20) facing each other, with the result that an elongated object (1) which is fed into one of the object conveyor's inlets (17, 19) receives one or two opposite orientations at the object input station (11), depending on which channel (15, 16) it is passed through.

10. A device according to claim 8 or 9,
characterized in that the actuators (46) for the distributing box's bottom hatches (9) are stationary and arranged to open and close the bottom hatch (9) which is located beside the actuator (46).

11. A device according to one of the claims 8 to 10,
characterized in that it is adapted to sorting and packing fish.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P_3
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Fig. 1

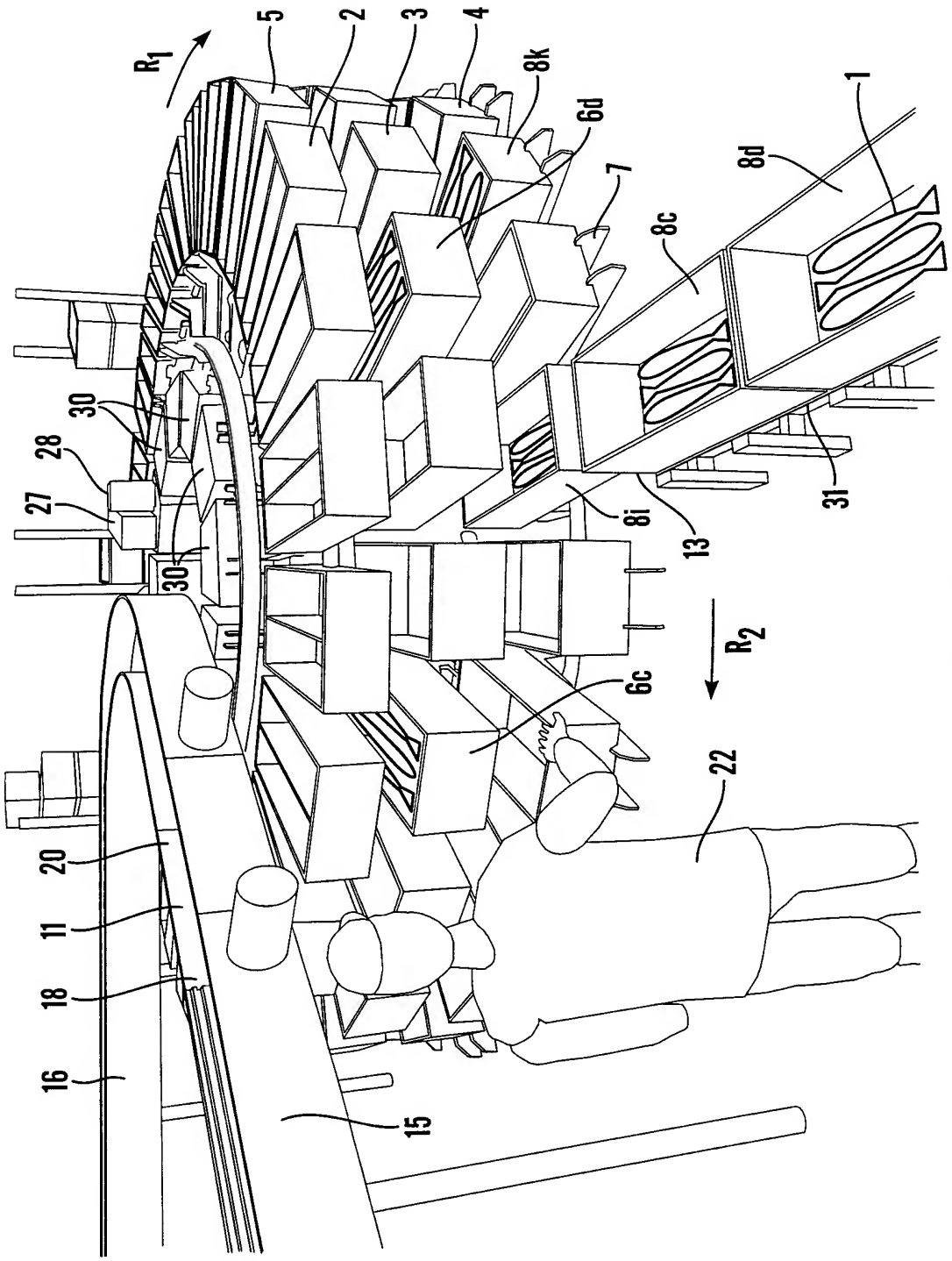

Fig.2

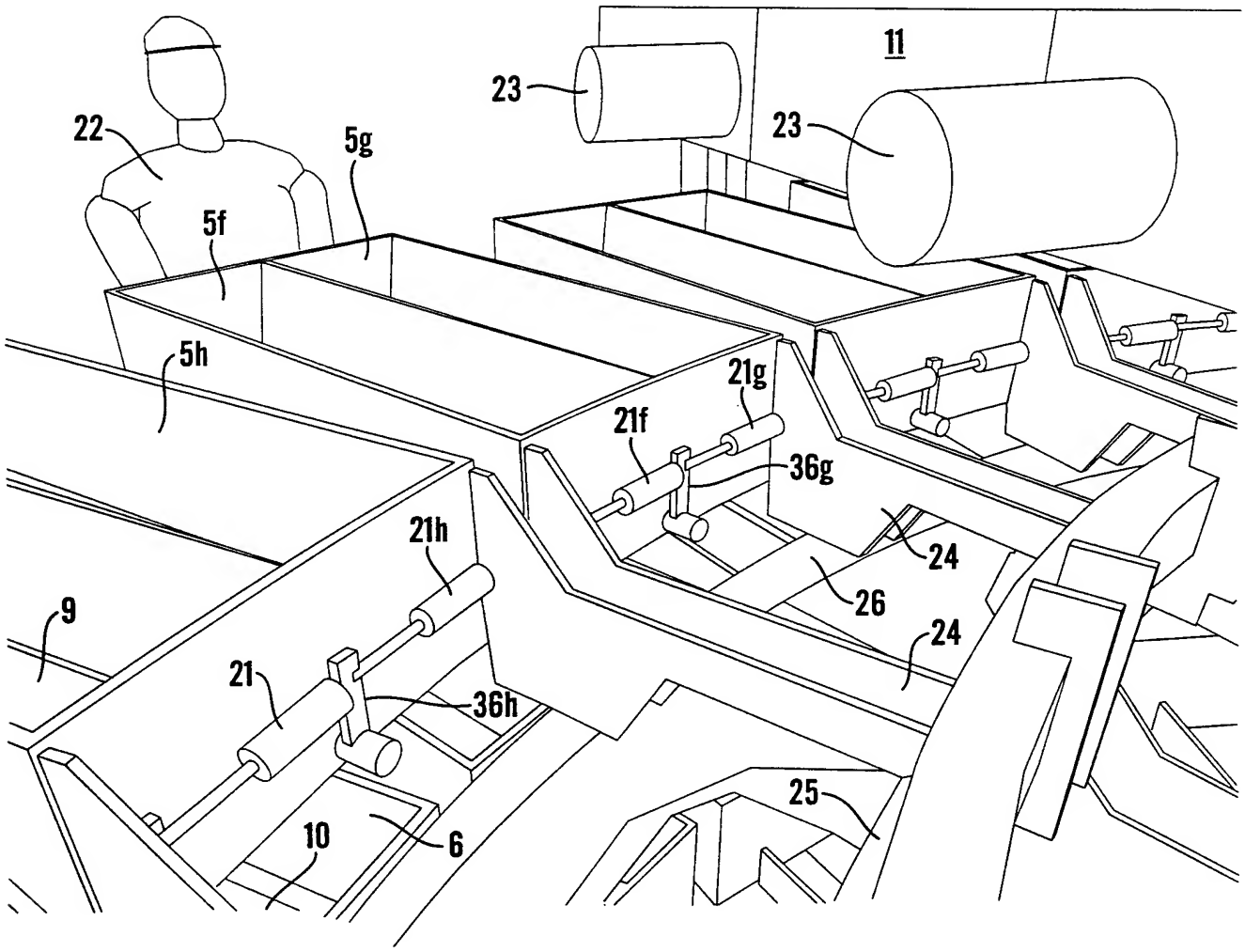

Fig.3

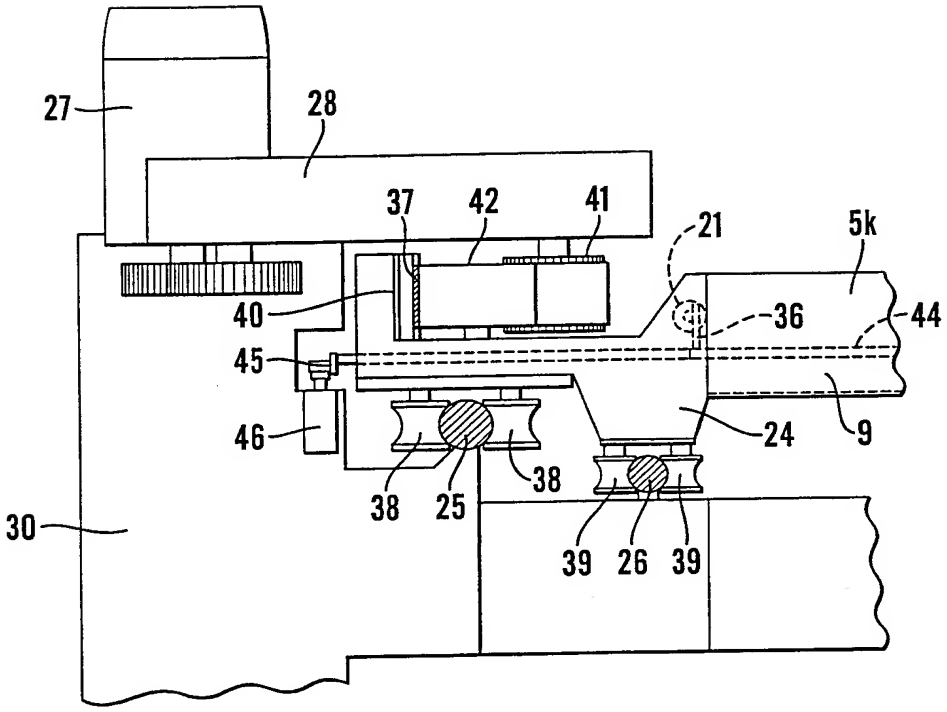
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Fig.4

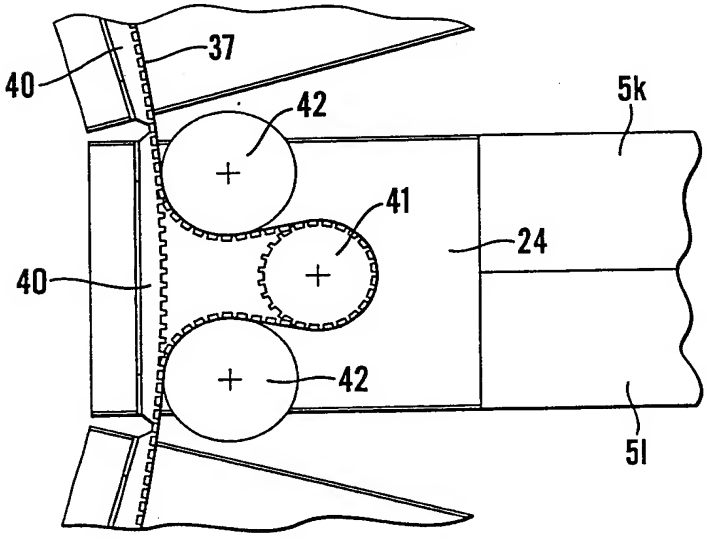
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Fig.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 00/00223

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65B 35/06, B65B 59/00, B65B 25/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B65B, B07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9501909 A1 (SCANVAEGT A/S), 19 January 1995 (19.01.95), abstract -- --------	1-11

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"P" document published prior to the international filing date but later than the priority date claimed
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"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 November 2000	03 -11- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Kristina Berggren/Els Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT
Information on patent family members

03/10/00

International application No.
PCT/NO 00/00223

WO	9501909	A1	19/01/95	AU	698435	B 29/10/98
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